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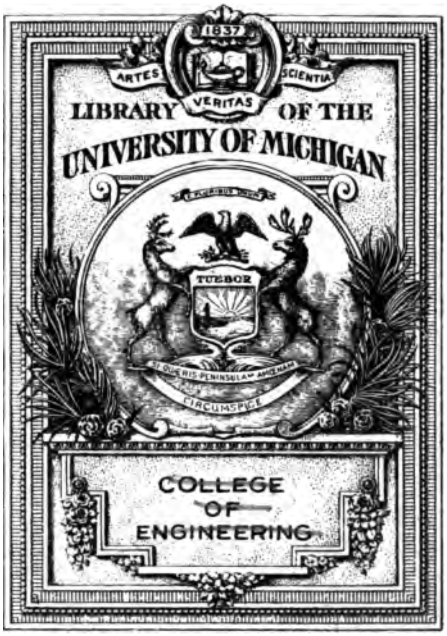

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# ORDNANCE MEMORANDA No. 24.

## Management of 8-inch Muzzle-loading Rifles and Carriages, Table of Ranges, Descriptive Plates, &c.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1884.

THE ORDNANCE BOARD, U. S. A.,
NEW YORK ARSENAL,
GOVERNOR'S ISLAND, N. Y. H., *May 31, 1884.*

The CHIEF OF ORDNANCE, U. S. A.,
*Washington, D. C.*

SIR:

In accordance with your instructions to the Ordnance Board dated January 14 and December 13, 1880, I have the honor to submit to you this day instructions for the working and management of 8-inch muzzle-loading guns and carriages, a table of ranges for the guns, and plates showing the gun, carriages, shot, shell, fuses, and sights.

For the Board.

Very respectfully, your ob't serv't,
T. G. BAYLOR,
*Colonel of Ordnance,*
*President of the Board.*

# 8-INCH MUZZLE-LOADING RIFLES, CONVERTED.

*The gun* (Plate I) is made by boring out a 10-inch Rodman smooth-bore and lining it with a reinforced coiled wrought-iron tube containing rifle grooves. A hole, called the "tell tale," drilled through to the surface of junction of the tube and casing, permits gas to escape if the tube is ruptured. Two patterns of these guns have been issued distinguished by the manner of inserting the tube—those first issued having the *muzzle insertion,* the later ones the *breech insertion;* with the latter the breech-plug increases the total length to 144. 91 inches.

*Principal Dimensions.*

| | | |
|---|---|---|
| Caliber | | 8 inches. |
| Length of chamber | | 10 inches. |
| Length of rifling | | 107. 25 inches. |
| Length of bore | | 117. 25 inches. |
| Length, total: | Muzzle insertion | 136. 66 inches. |
| | Breech insertion | 144. 91 inches. |

| | Guns Nos. 1 to 28. | Guns above No. 28. |
|---|---|---|
| Number of lands and grooves | 15 | 24 |
| Width of lands | 0″. 8377 | 0″. 3490 |
| Width of grooves | 0″. 8377 | 0″. 6982 |
| Depth of grooves | 0″. 075 | 0″. 075 |
| Twist uniform | 1 turn in 40 feet. | 1 turn in 30 feet. |

| | |
|---|---|
| Weight of gun | 16,020 pounds. |
| Counter preponderance | 189 pounds. |

*The Sights* (Plates II and III) are two in number, one for the breech and one for the front.

The breech sight consists of a tangent scale affixed to a circular base revolving in a plane normal to the axis of the piece to compensate for inclination of the trunnions. The scale can move laterally on its base to correct for wind and drift. It is graduated from 0 to 7 degrees. A graduated arc placed on the cheek of the carriage below the trunnion bed and a pointer attached to the trunnion are used when depression or an elevation greater than seven degrees is required.

The front sight is a single piece fastened to the gun by two screws, its upper extremity terminating in a blade.

*The Projectiles* (Plates IV and V) used are chilled shot, common shot, or shell of either the Butler or Eureka pattern.

| | |
|---|---|
| Chilled shot | weight 183 pounds. |
| Common shot | weight 180 pounds. |
| Shell | weight 153 pounds. |

### *Velocity and Penetration of Chilled Shot.*

| RANGE. *Yards.* | VELOCITY. *Feet.* | PENETRATION. *Inches.* | |
|---|---|---|---|
| 0 | 1,403 | 9.96 | The chilled shot will, at 1,200 yards, perforate 8 inches of wrought-iron backed by 24 inches of oak and a 1-inch skin plate. |
| 500 | 1,302 | 9.08 | |
| 1,000 | 1,214 | 8.31 | |
| 1,500 | 1,136 | 7.65 | |
| 2,000 | 1,069 | 7.08 | |
| 2,500 | 1,018 | 6.67 | |
| 3,000 | 980 | 6.36 | |

*Charges* are of hexagonal E. V. powder, having a granulation of 72 to the pound and specific gravity of 1.75.

Weight of charge, 35 pounds.

*The Fuses* (Plate VI) now used are the paper time-fuse and the Hotchkiss percussion-fuse.

The implements and equipments required are as follows:

2 Rammers and staves.
2 Sponges and staves.
2 Sponge covers.
1 Worm and staff to six pieces or less.
1 Ladle to six pieces or less.
1 Gunner's level to six pieces or less.
1 Gunner's quadrant, brass.
1 Pass-box (metallic, zinc cylinder).
2 Tube pouches.
2 Thumb-stalls.
2 Priming-wires.
1 Gunner's gimlet.
1 Vent-punch, to six pieces or less.
1 Breech-sight and socket for casemate.
1 Breech-sight and socket for barbette.
1 Front-sight for casemate.
1 Front-sight for barbette.
1 Vent cover.
2 Lanyards.
1 Muzzle cover and strap.
1 Large monkey-wrench to six pieces or less.
2 Double wrenches for 0''.75 and 1'' bolts.
2 Front handspikes (top carriage), one end tapering to fit mortises of wheels, and the other end with eye to attach rope for carriages with friction recoil check.
2 Rear handspikes, one end tapering to fit sockets, top carriage.
2 Pinch-bars for chassis.
2 Maneuvering handspikes, one end tapering to fit mortises in traverse wheels.

2 Recoil-check handspikes.
1 Pointer, for left trunnion.
1 Graduated arc for left cheek of carriage.
2 Iron wheel chocks, right and left.
2 Shot-hooks.
2 Shot-carrying bars.
1 Haversack.
1 Funnel for filling shells.
1 Water tub.
1 Crane arm.
1 Crane post.
1 Crane brace.
1 Crane step.
1 Differential pulley.
2 Hand-barrows.

*The Carriages* are of two kinds, one having the friction recoil check, the other the hydraulic buffer.

*General description and directions for management of casemate and barbette carriages for 8-inch muzzle-loading rifles having friction recoil checks.* (Plates VII and VIII.)

These carriages are alterations from the iron carriages heretofore provided for the 10-inch smooth-bore Rodman guns.

For running in and out of battery, these carriages are provided with one set of eccentric axles and wheels in rear. In moving from battery, only the rear axle is thrown into gear, and the carriage worked back by means of handspikes placed in the mortises of the front wheels.

In moving into battery, the rear axle is thrown into gear as before; but the rear handspike should remain in the axle-sockets so that the rear axle can be quickly thrown out of gear if the carriage runs in too rapidly.

For the barbette carriages a crane and differential pulley is provided for the purpose of hoisting the projectiles and swinging them around in front of the muzzle of the gun.

Before the gun is fired this crane should be swung back and secured against the side of the top carriage.

The elevation and depression of the gun is effected by the hand wheel on left-hand side of top carriage, which operates the toothed arc and compound geared wheels.

In pointing, the gun is first directed on the object and then the necessary elevation or depression is given by this wheel, being indicated by the elevating arc and pointer.

To check recoil a device called a friction-recoil check is employed. This consists of a box-clamp and two small friction-plates or gibs, acting in contact with the upper and lower surfaces of a single broad wrought-iron bar extending midway between the chassis rails nearly the length of the carriage and having a slight taper.

A compressor-screw passes through the upper half of the clamp and has holes in its head through which the recoil handspike can be inserted to bring the gibs and the bar firmly together before the gun is fired, and to loosen the clamp-screw to run the carriage into battery.

The clamp or compressor, when not in use, should be left in the same condition as when ready to fire the gun. The friction-plate should be free from grease or oil and left rough or rusty.

The casemate carriage has two bars for compressor clamp-screw—one long, the other short. The short one is to close the clamp when the gun is loaded and in battery, as there is not space to use the long one. The long one is to open the clamp after the gun is fired and the recoil has taken place. In closing the clamp prior to firing the gun all the power that two men can ordinarily exert should be put on the bar.

The casemate carriages being entirely on rolling friction, the traversing is easily effected by inserting the maneuvering handspikes into the mortises of the rear traverse wheels; and for small motions by the use of pinch-bars between the traverse rails and wheels.

Some of the barbette carriages are also on rolling friction, and hereafter all of them will be so made. In some of the old carriages there is a front eccentric axle to the chassis which has to be thrown into gear before traversing.

### *General description of casemate and barbette carriages with hydraulic buffers for 8-inch muzzle-loading rifles.* (Plates IX and X.)

These carriages are alterations from the old 10-inch smooth-bore carriages.

For running in and out of battery these carriages are provided with two sets of wheels front and rear, which turn on journals passing through two bronze pieces firmly secured to the front and rear end of the top carriage, the journals for the rear wheels being eccentric. Furthermore there is provided a windlass with pawl and ratchet, placed between the rear ends of chassis rails and worked by cranks on both sides, a rope being secured to rear transom of top carriage and passing over the drum of windlass. In running from battery the rear eccentric journals are thrown into gear and the top carriage runs from battery by operating the cranks on both sides. In running into battery the rope is passed over drum of windlass, brought taut and held by two or three men; the rear journals then being thrown into gear, the carriage is allowed to run into battery by paying away on rope.

In action, to load from battery, two spring catches are placed on the inside of each chassis rail to hold the top carriage, after its recoil, at the most convenient point for loading, and after loading the catches are withdrawn by means of two levers on outside of each chassis rail.

To load in battery, these catches are withdrawn and the gun, after its recoil, will run into battery gently without assistance.

In carriages made hereafter there will be substituted for the catches a ratchet bolted to the chassis, in which a pawl attached to the gun carriage engages and retains the gun in the position to which it may have recoiled. An eccentric lever is connected with the pawl to release it from the ratchet.

To check the recoil an hydraulic buffer is employed which is described as follows:

A cast-iron cylinder about 8½ feet in length, 10 inches interior diameter, and 2¼ inches thick, is securely placed at the front end of and between the chassis rails. The cylinder is closed at each end by a cast-iron cap fastened on by screws. For the purpose of admitting water in the cylinder, or whatever fluid may be used, a hole ¾ of an inch in diameter is bored on the upper surface of the cylinder and 16. 25 inches from its rear end; a similar hole in the bottom of front cap of cylinder allows the fluid to be withdrawn. Each hole is closed by a screw-plug. The piston-rod, 2. 25 inches in diameter, is made of wrought-iron, and, after passing through the rear cap, is attached to a cross-head of wrought-iron 11. 25 inches high and 28 inches long, which in its turn is secured to the rear of the top carriage. To allow the piston-rod a vertical play the hole through which the end passes is made oblong.

Through the ring which forms the end of the rod a steel cylindrical pin is passed, at each end of which is a steel cylindrical roller. The piston-head of wrought-iron, 2.5 inches thick, is pierced with four holes, the centers of which are 1.3 inches from the circumference and equally distant from each other. The diameters of these holes are ⅝ of an inch at the centers but flare outwards to a diameter of 1.25 on the faces of the piston-head to give the fluid acted upon by the piston-head, when the gun recoils, sufficient escape, and while checking recoil to allow the top carriage to move back without strain. To the upper surface of each rail of the chassis and 95 inches from the front end is bolted a wrought-iron inclined plane having a rise of 2.5 inches in 64 inches, its width being 3.25 inches. Near the upper end of and in this plane a cut is made 6 inches wide to receive an angle-iron 6 inches by 6 inches. To this angle-iron three rubber spring hurters, 5 inches long by 5 inches in diameter, are secured by screw-bolts. To the front transom of the chassis are secured, by similar irons, the same number and kind of springs to form counter hurters. In recoiling after firing the top carriage starts and moves on sliding friction, but when the rear end is raised up slightly on the inclined plane the friction becomes rolling and the ascent of the inclined planes absorbs a portion of the recoil, and when the recoil is overcome the carriage will, if unrestrained, roll gently into battery. Thirteen (13) gallons of mineral or sperm oil are poured into the cylinder before firing.

## *Range Table.*

| | CHILLED SHOT.<br>Weight .......... .......183 pounds.<br>Initial velocity............ 1,403 feet. | | | | | COMMON SHOT.<br>Weight.... 180 pounds.<br>Initial velocity. 1,414 ft. | | | SHELL.<br>Weight.. 153 lbs.<br>Initial velocity, 1,475 feet. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Angle of— | | | | Remaining velocity. | Angle of elevation. | | Remaining velocity. | Angle of elevation. | | Time of flight. |
| | Elevation. | | Fall. | | | | | | | | |
| s. | *Deg.* | *Min.* | *Deg.* | *Min.* | *Feet.* | *Deg.* | *Min.* | *Feet.* | *Deg.* | *Min.* | *Sec'ds.* |
| 0 | | 8 | | 9 | 1,382 | | 7 | 1,392 | | 8 | .2 |
| 0 | | 16 | | 19 | 1,360 | | 14 | 1,370 | | 16 | .4 |
| 0 | | 24 | | 29 | 1,340 | | 22 | 1,349 | | 24 | .6 |
| 0 | | 32 | | 39 | 1,320 | | 31 | 1,329 | | 32 | .8 |
| 0 | | 41 | | 50 | 1,301 | | 40 | 1,309 | | 40 | 1.1 |
| 0 | | 51 | 1 | 1 | 1,282 | | 49 | 1,290 | | 48 | 1.3 |
| 0 | 1 | 1 | 1 | 12 | 1,264 | | 59 | 1,271 | | 57 | 1.5 |
| 0 | 1 | 11 | 1 | 23 | 1,247 | 1 | 9 | 1,253 | 1 | 6 | 1.8 |
| 0 | 1 | 21 | 1 | 34 | 1,230 | 1 | 20 | 1,235 | 1 | 15 | 2. |
| 0 | 1 | 32 | 1 | 45 | 1,213 | 1 | 31 | 1,218 | 1 | 25 | 2.2 |
| 0 | 1 | 43 | 1 | 57 | 1,197 | 1 | 42 | 1,202 | 1 | 35 | 2.5 |
| 0 | 1 | 54 | 2 | 10 | 1,181 | 1 | 53 | 1,185 | 1 | 46 | 2.7 |
| 0 | 2 | 5 | 2 | 23 | 1,165 | 2 | 4 | 1,170 | 1 | 56 | 3. |
| 0 | 2 | 16 | 2 | 36 | 1,150 | 2 | 15 | 1,154 | 2 | 7 | 3.2 |
| 0 | 2 | 27 | 2 | 51 | 1,136 | 2 | 26 | 1,139 | 2 | 17 | 3.5 |
| 0 | 2 | 38 | 3 | 6 | 1,122 | 2 | 37 | 1,125 | 2 | 28 | 3.8 |
| 0 | 2 | 50 | 3 | 21 | 1,108 | 2 | 48 | 1,111 | 2 | 40 | 4. |
| 0 | 3 | 2 | 3 | 36 | 1,095 | 2 | 59 | 1,098 | 2 | 52 | 4.3 |
| 0 | 3 | 14 | 3 | 52 | 1,083 | 3 | 11 | 1,086 | 3 | 4 | 4.6 |
| 0 | 3 | 26 | 4 | 9 | 1,072 | 3 | 23 | 1,074 | 3 | 16 | 4.9 |
| 0 | 3 | 38 | 4 | 26 | 1,061 | 3 | 35 | 1,063 | 3 | 28 | 5.2 |
| 0 | 3 | 51 | 4 | 43 | 1,051 | 3 | 48 | 1,053 | 3 | 40 | 5.4 |
| 0 | 4 | 4 | 5 | 1 | 1,041 | 4 | 1 | 1,042 | 3 | 53 | 5.7 |
| 0 | 4 | 17 | 5 | 19 | 1,032 | 4 | 14 | 1,033 | 4 | 7 | 6. |
| 0 | 4 | 30 | 5 | 38 | 1,023 | 4 | 27 | 1,024 | 4 | 20 | 6.3 |
| 0 | 4 | 44 | 5 | 57 | 1,014 | 4 | 41 | 1,015 | 4 | 34 | 6.6 |
| 0 | 4 | 58 | 6 | 16 | 1,006 | 4 | 55 | 1,007 | 4 | 48 | 6.9 |
| 0 | 5 | 12 | 6 | 35 | 998 | 5 | 9 | 998 | 5 | 3 | 7.3 |
| 0 | 5 | 26 | 6 | 55 | 990 | 5 | 23 | 990 | 5 | 17 | 7.6 |
| 0 | 5 | 41 | 7 | 16 | 983 | 5 | 37 | 983 | 5 | 32 | 7.9 |
| 0 | 5 | 56 | 7 | 37 | 976 | 5 | 52 | 976 | 5 | 47 | 8.2 |
| 0 | 6 | 11 | 7 | 58 | 969 | 6 | 8 | 968 | 6 | 2 | 8.5 |
| 0 | 6 | 27 | 8 | 19 | 962 | 6 | 24 | 962 | 6 | 18 | 8.8 |
| 0 | 6 | 43 | 8 | 41 | 956 | 6 | 40 | 955 | 6 | 34 | 9.1 |
| 0 | 6 | 59 | 9 | 3 | 950 | 6 | 56 | 949 | 6 | 50 | 9.5 |
| 0 | 7 | 15 | 9 | 25 | 944 | 7 | 12 | 943 | 7 | 6 | 9.8 |
| 0 | 7 | 31 | 9 | 48 | 938 | 7 | 28 | 937 | 7 | 22 | 10.1 |

## *Range Table*—Continued.

| Distance of Object. | CHILLED SHOT.<br>Weight................ 183 pounds.<br>Initial velocity ........... 1,403 feet. | | | | | COMMON SHOT.<br>Weight.... 180 pounds.<br>Initial velocity . 1,414 ft. | | | SHELL.<br>Weight, 153 lbs.<br>Initial velocity, 1,475 feet. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Angle of— | | | | Remaining velocity. | Angle of elevation. | | Remaining velocity. | Angle of elevation. | | Time of flight. |
| | Elevation. | | Fall. | | | | | | | | |
| *Yds.* | *Deg.* | *Min.* | *Deg.* | *Min.* | *Feet.* | *Deg.* | *Min.* | *Feet.* | *Deg.* | *Min.* | *Sec'ds.* |
| 3,800 | 7 | 47 | 10 | 11 | 932 | 7 | 44 | 932 | 7 | 40 | 10.4 |
| 3,900 | 8 | 4 | 10 | 35 | 926 | 8 | 0 | 926 | 7 | 56 | 10.8 |
| 4,000 | 8 | 21 | 10 | 59 | 921 | 8 | 16 | 920 | 8 | 13 | 11.2 |
| 4,100 | 8 | 38 | 11 | 24 | 916 | 8 | 33 | 915 | 8 | 30 | 11.5 |
| 4,200 | 8 | 56 | 11 | 49 | 911 | 8 | 50 | 910 | 8 | 47 | 11.9 |
| 4,300 | 9 | 14 | 12 | 15 | 906 | 9 | 9 | 905 | 9 | 4 | 12.2 |
| 4,400 | 9 | 32 | 12 | 41 | 901 | 9 | 28 | 900 | 9 | 21 | 12.6 |
| 4,500 | 9 | 50 | 13 | 8 | 896 | 9 | 47 | 895 | 9 | 48 | 12.9 |
| 4,600 | 10 | 8 | 13 | 36 | 891 | 10 | 6 | 890 | 10 | 5 | 13.3 |
| 4,700 | 10 | 26 | 14 | 4 | 886 | 10 | 25 | 885 | 10 | 22 | 13.7 |
| 4,800 | 10 | 45 | 14 | 32 | 881 | 10 | 43 | 880 | 10 | 39 | 14. |
| 4,900 | 11 | 4 | 15 | 0 | 876 | 11 | 3 | 875 | 10 | 57 | 14.4 |
| 5,000 | 11 | 23 | 15 | 30 | 871 | 11 | 22 | 870 | 11 | 16 | 14.8 |
| 5,100 | 11 | 42 | 16 | 0 | 866 | 11 | 41 | 866 | 11 | 37 | 15.2 |
| 5,200 | 12 | 2 | 16 | 32 | 861 | 12 | 0 | 861 | 11 | 59 | 15.6 |
| 5,300 | 12 | 22 | 17 | 5 | 856 | 12 | 19 | 857 | 12 | 21 | 16. |
| 5,400 | 12 | 42 | 17 | 38 | 851 | 12 | 38 | 852 | 12 | 43 | 16.4 |
| 5,500 | 13 | 3 | 18 | 12 | 846 | 12 | 57 | 847 | 13 | 5 | 16.7 |
| 5,600 | 13 | 24 | 18 | 46 | 841 | 13 | 17 | 842 | 13 | 27 | 17.1 |
| 5,700 | 13 | 45 | 19 | 20 | 836 | 13 | 38 | 838 | 13 | 49 | 17.5 |
| 5,800 | 14 | 6 | 19 | 58 | 832 | 14 | 0 | 833 | 14 | 11 | 18. |
| 5,900 | 14 | 28 | 20 | 37 | 828 | 14 | 23 | 828 | 14 | 34 | 18.4 |
| 6,000 | 14 | 50 | 21 | 16 | 824 | 14 | 46 | 824 | 14 | 58 | 18.8 |
| 6,100 | 15 | 12 | 21 | 57 | 820 | 15 | 9 | 819 | 15 | 21 | 19.3 |
| 6,200 | 15 | 35 | 22 | 38 | 816 | 15 | 32 | 815 | 15 | 45 | 19.7 |
| 6,300 | 15 | 58 | 23 | 21 | 812 | 15 | 55 | 811 | 16 | 10 | 20.1 |
| 6,400 | 16 | 22 | 24 | 7 | 808 | 16 | 18 | 807 | 16 | 35 | 20.6 |
| 6,500 | 16 | 46 | 24 | 53 | 804 | 16 | 42 | 803 | 17 | 0 | 21. |
| 6,600 | 17 | 10 | 25 | 43 | 800 | 17 | 6 | 799 | 17 | 26 | 21.5 |
| 6,700 | 17 | 35 | 26 | 35 | 796 | 17 | 31 | 795 | 17 | 51 | 21.9 |
| 6,800 | 18 | 0 | 27 | 29 | 792 | 17 | 57 | 790 | 18 | 16 | 22.4 |
| 6,900 | 18 | 27 | 28 | 28 | 788 | 18 | 24 | 785 | 18 | 31 | 22.9 |
| 7,000 | 18 | 55 | 29 | 28 | 784 | 18 | 52 | 781 | 19 | 4 | 23.4 |

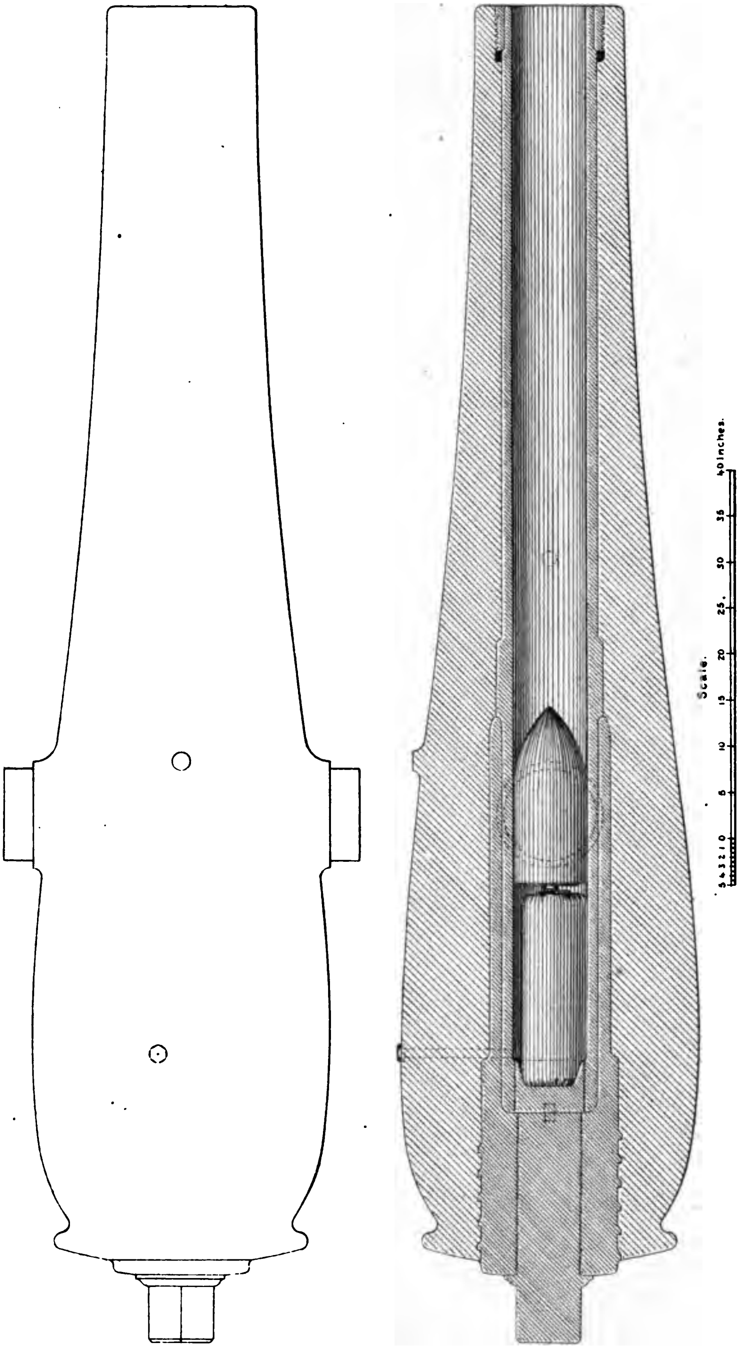
ORDNANCE OFFICE,
WASHINGTON, *June* 28, 1884.

Publication authorized by the SECRETARY OF WAR:

S. V. BENÉT,
*Brigadier General*,
Chief of Ordnance.

PLATE I.

8 INCH M.L. RIFLE. (BREECH INSERTION)



Ord. Mem. 24.

**PLATE II.**

# SIGHTS ON 8 INCH M. L. RIFLES.

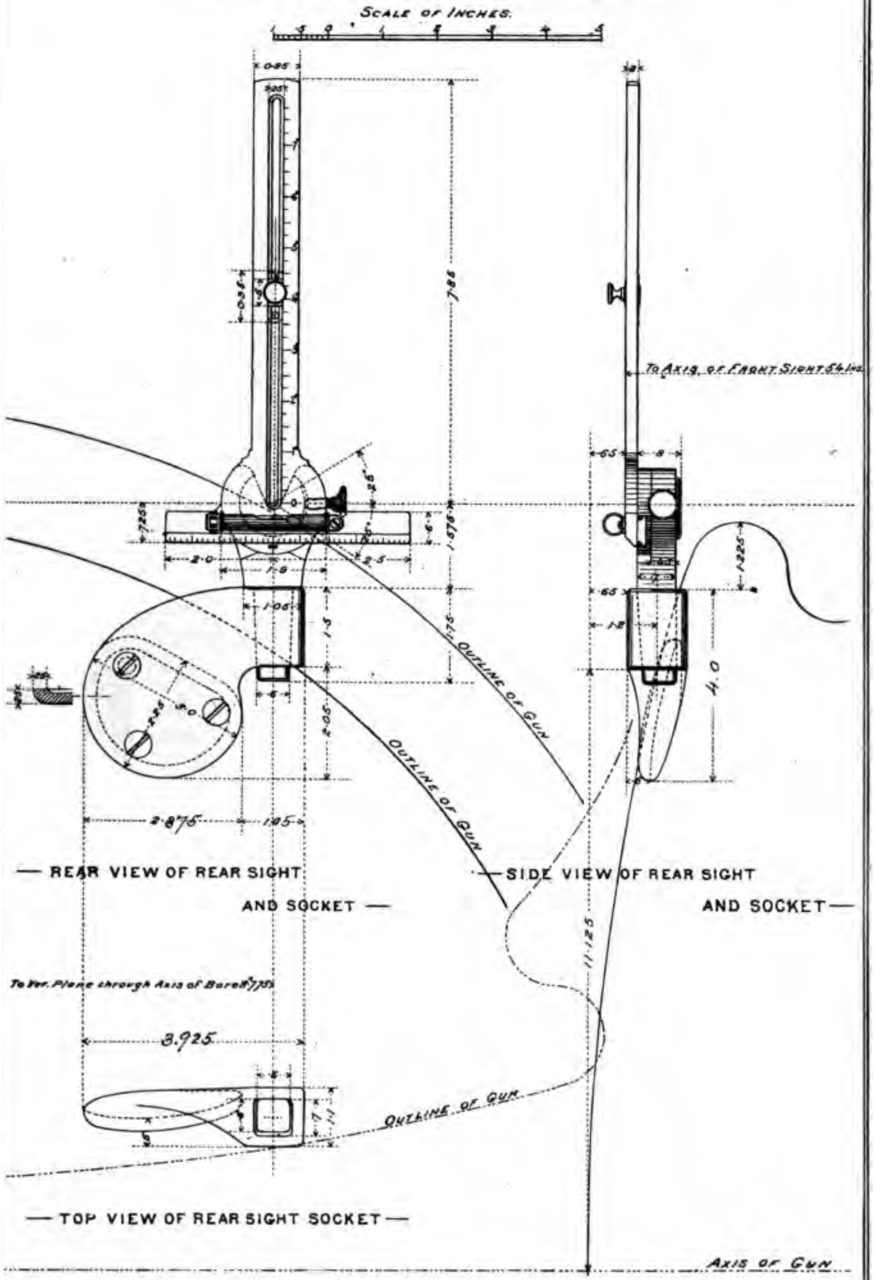


PLATE III.

# SIGHTS ON 8 INCH M.L.RIFLES.

SCALE OF INCHES.

**REAR VIEW OF FRONT SIGHT** **SIDE VIEW OF FRONT SIGHT**

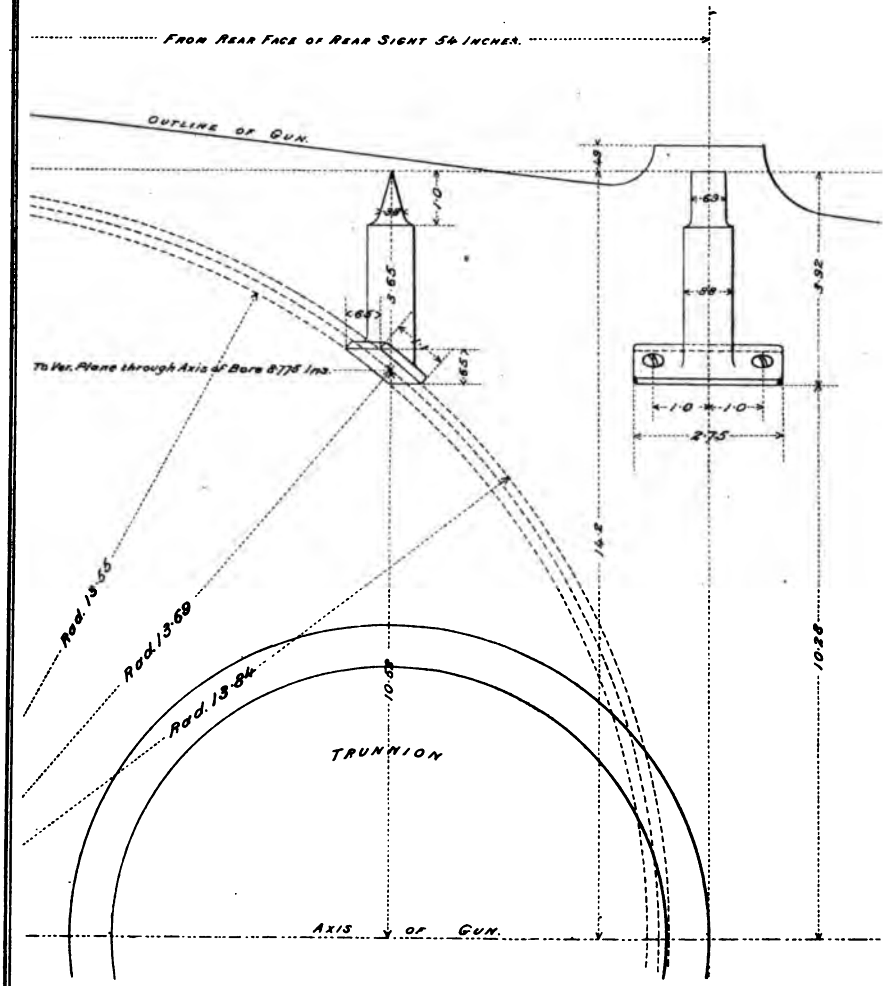
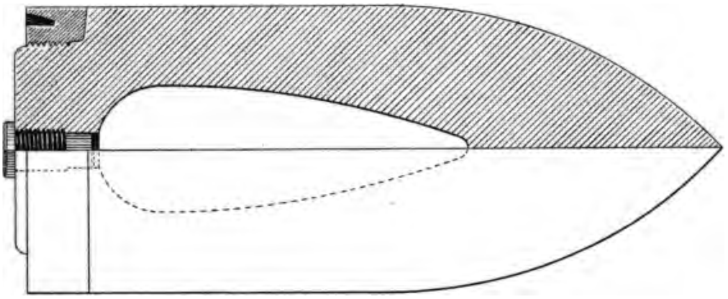
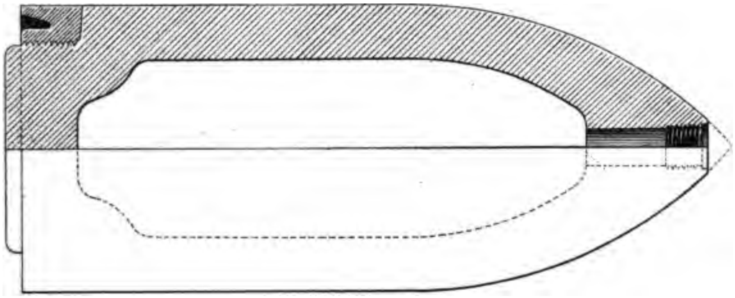


PLATE IV.

## 8 INCH BUTLER SHOT.



## 8 INCH BUTLER SHELL.



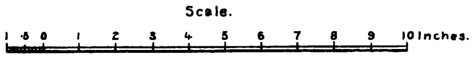
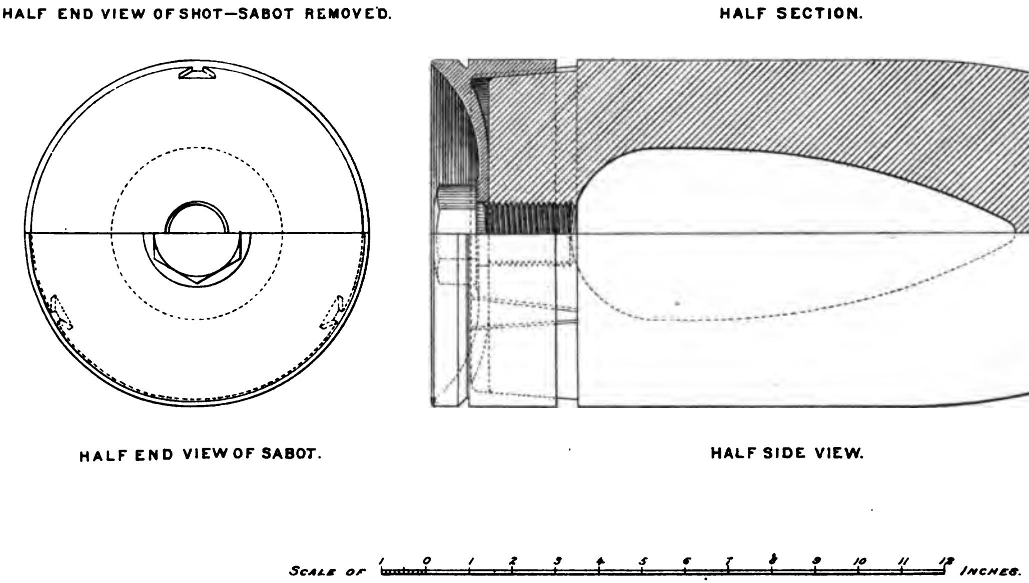


PLATE V.

## 8 INCH EUREKA CORED SHOT FOR M. L. RIFLE.

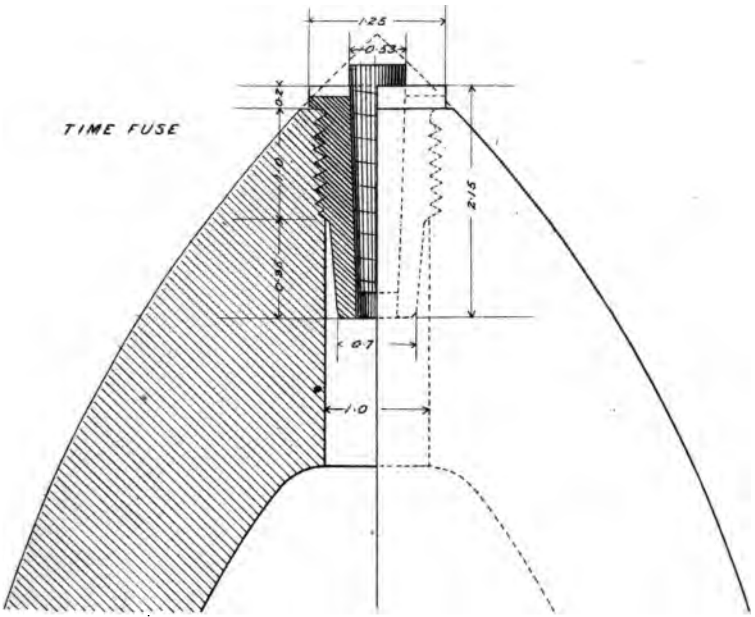
— WEIGHT 180 LBS. —



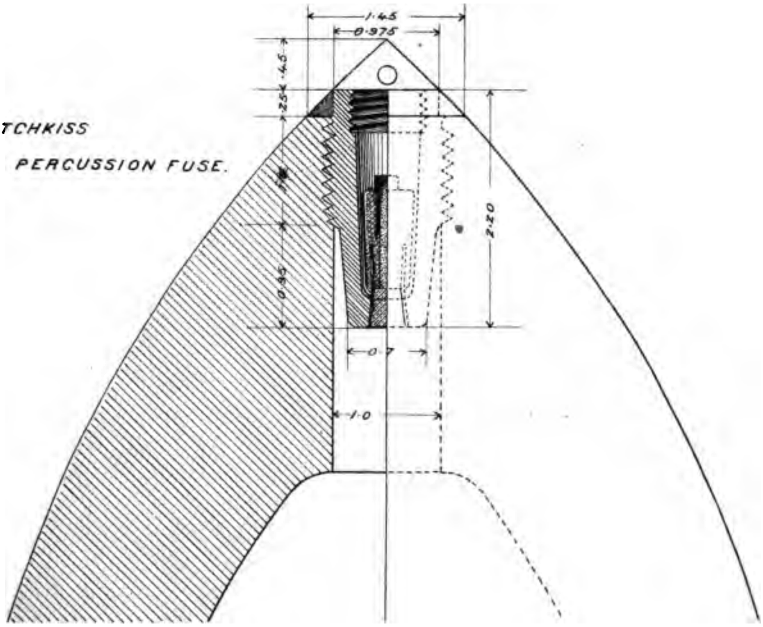
HALF END VIEW OF SHOT—SABOT REMOVED.
HALF SECTION.
HALF END VIEW OF SABOT.
HALF SIDE VIEW.
SCALE OF 1 0 1 2 3 4 5 6 7 8 9 10 11 12 INCHES.

PLATE VI.

# FUSES FOR 8 INCH SHELLS.



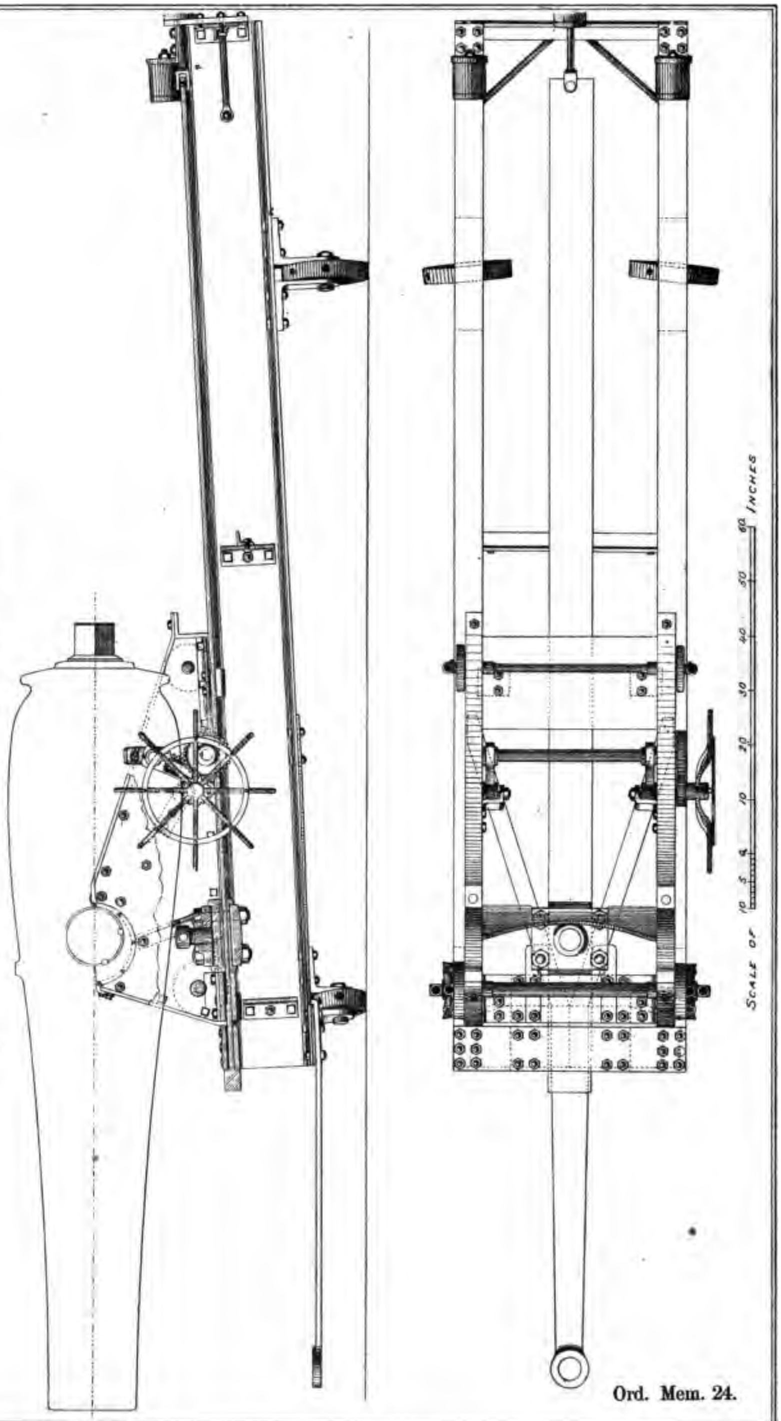
TIME FUSE



HOTCHKISS PERCUSSION FUSE.

# CASEMATE CARRIAGE FOR 8 INCH M L RIFLE.

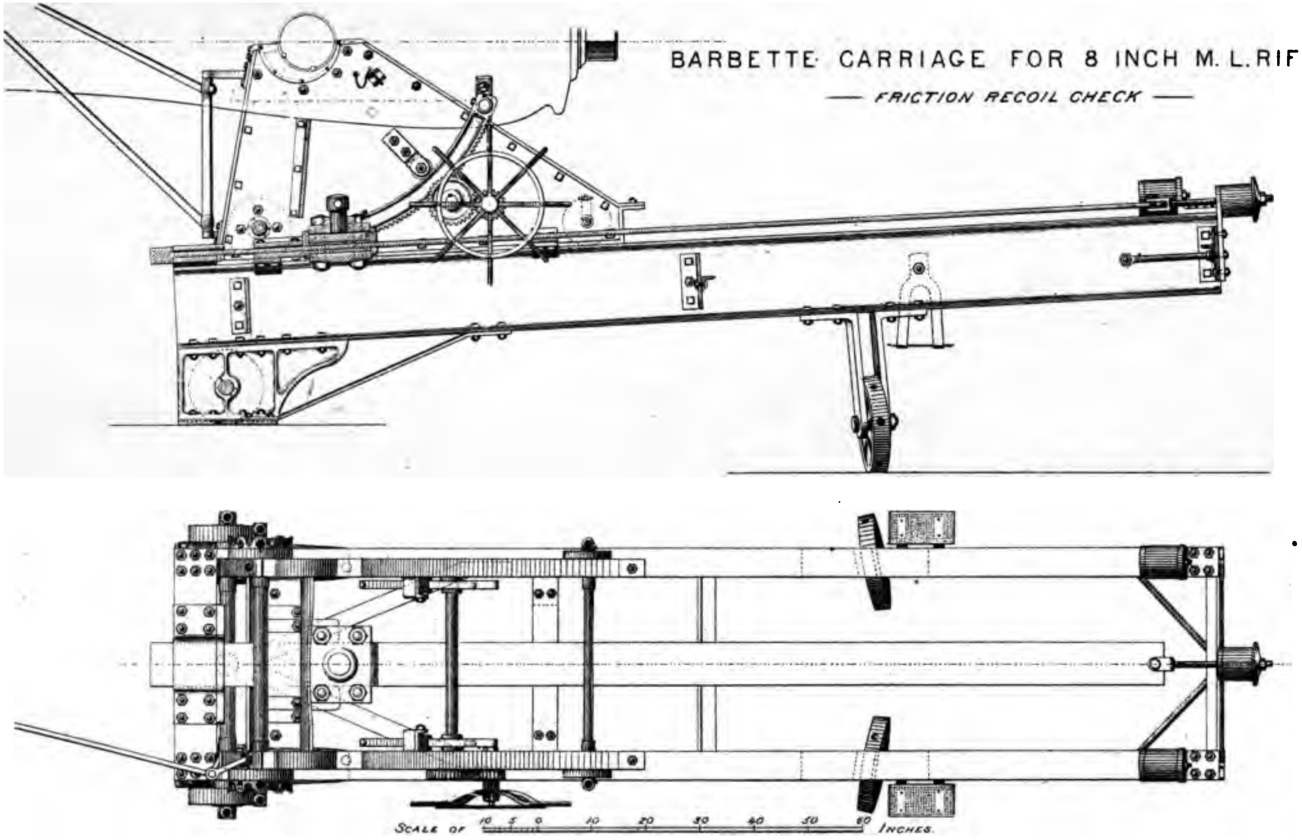
## — FRICTION RECOIL CHECK —



Ord. Mem. 24.

# BARBETTE CARRIAGE FOR 8 INCH M. L. RIFLE.

— FRICTION RECOIL CHECK —



# BARBETTE CARRIAGE FOR 8 INCH M. L. RIFLE.

## — HYDRAULIC CYLINDER —